Insights into atmospheric aerosol particle morphology from simulations of single-particle light scattering

Gabriel Seymour[a,*], Daniel Landgraf[a], Ronald Pinnick[b], Yong-Le Pan[b], and Kevin Aptowicz[a]

[a]*West Chester University, 700 S. High St., West Chester, PA 19382, USA*
[b]*US Army Research Laboratory, 2800 Powder Mill Road, Adelphi, MD 20783, USA*

[*]*Presenting author (GS855813@wcupa.edu)*

Characterizing the distribution of aerosol particles in Earth's atmosphere is a challenging endeavor. Traditionally, aerosol distributions are extracted from land-based and space-based measurements of light scattering. However, in order to invert light scattering data to characterize aerosol distributions, the light scattering properties of the constituent particles must be known. Although the scattering properties of homogenous spherical particles are well known, the same is not true for nonspherical particles. In this work, we explore different models of nonspherical aerosol particles and test our models using light scattering from real atmospheric aerosol particles. In particular, using an image autocorrelation method which was previously devised, we quantify features in the light scattering patterns from atmospheric aerosol particles. Using three different models for nonspherical particles (i.e., spheroids, Chebyshev, and inclusions) we calculated simulated light scattering patterns and performed the autocorrelation analysis on these simulated patterns. We then compared the results of the analysis of the simulated particles to that of the experimentally captured atmospheric aerosols particles. We found that the calculated light scattering patterns from simulated spheroids particles were the best match to the experimentally captured light scattering patterns from atmospheric aerosol particles.

Preferred mode of presentation: Poster